

WHAT IS CLAIMED IS:

1. A method for configuring a wireless node in a wireless communications network, comprising:
5 establishing connectivity between a wireless node and at least one wireline node;
establishing connectivity between the wireless node and a plurality of neighboring wireless nodes through the wireline node; and
10 configuring the wireless node based on information exchanged with the neighboring wireless nodes through the wireline node
2. The method of Claim 1, further comprising:
15 exchanging site impact information between the wireless node and the neighboring wireless nodes; and
configuring the wireless node based on site impact information received from the neighboring wireless nodes.
- 20 3. The method of Claim 2, further comprising
configuring at least one of the neighboring wireless nodes based on interference impact information received from the wireless node.

4. The method of Claim 1, establishing connectivity between the wireless node and the neighboring wireless nodes comprising:

broadcasting a wireless discovery message through the wireline router to a set of nodes, the wireless discovery message including site impact information on the wireless node;

each wireless node in the set of nodes determining whether it is a neighboring wireless node based on the wireless discovery message;

each neighboring wireless node responding with a neighbor reply message including site impact information on the neighboring wireless node; and

identifying the neighboring wireless nodes based on the neighbor reply messages.

5. The method of Claim 1, further comprising negotiating operating parameters between the wireless node and the neighboring wireless nodes.

6. The method of Claim 1, further comprising establishing a virtual path between the wireless node and each of the neighboring wireless nodes.

7. The method of Claim 1, further comprising and establishing a label switch path (LSP) between the wireless node and each of the neighboring wireless nodes.

8. The method of Claim 1, wherein connectivity between the wireless node and the wireline node is established using the Internet protocol.

9. The method of Claim 1, wherein the connectivity between the wireless node and the neighboring wireless nodes is established through the set of wireline nodes using the Internet protocol.

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10. The method of Claim 1, further comprising determining services available to the wireless node using the wireline and wireless connectivity.

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11. The method of Claim 4, further comprising: each wireless node in the set of wireless nodes determining whether it is a potential neighboring wireless node based on the wireless discovery message;

15 each potential neighboring wireless node responding with a neighbor reply message including site impact information on the potential neighboring wireless node; and

20 identifying the neighboring wireless nodes by prioritizing the potential neighboring wireless nodes by coverage and interference analysis based on the neighbor reply messages.

25 12. The method of Claim 1, wherein the wireless node is a wireless router and the wireline node is a wireline router.

30 13. The method of Claim 2, wherein the site impact information for the wireless node comprises geographic parameters for the wireless node.

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14. The method of Claim 2, wherein the site impact information for the wireless node comprises network configuration parameters for the wireless node.

15. The method of Claim 2, wherein the site impact information for the wireless node comprises service configuration parameters for the wireless node.

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16. The method of Claim 2, wherein the site impact information for the wireless node comprises antenna parameters for the wireless node.

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17. The method of Claim 2, wherein the site impact information for the wireless node comprises a plurality of geographic parameters, network configuration parameters, service configuration parameters, and antenna parameters for the wireless node.

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18. The method of Claim 2, wherein the site impact information for the wireless node comprises technology specific information for the wireless node.

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19. The method of Claim 16, wherein the site impact information for the wireless node comprises coverage parameters for the wireless node.

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20. The method of Claim 18, wherein the site impact information for the wireless node comprises spectrum parameters for the wireless node.

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21. The method of Claim 18, wherein the site impact information for the wireless node comprises channel parameters for the wireless node.

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22. The method of Claim 18, wherein the site impact information for the wireless node comprises interference parameters for the wireless node.

5 23. The method of Claim 18, wherein the site impact information for the wireless node comprises control parameters for the wireless node.

10 24. The method of Claim 18, wherein the site impact information for the wireless node comprises threshold parameters for the wireless node.

15 25. The method of Claim 18, wherein the site impact information for the wireless node comprises a plurality of coverage, spectrum, channel, interference, control, and threshold parameters for the wireless node.

20 26. The method of Claim 2, further comprising, determining radio frequency (RF) coverage for the wireless node based on the site impact information.

25 27. The method of Claim 2, further comprising determining interference between the wireless node and the neighboring wireless nodes based on the site impact information.

30 28. The method of Claim 2, further comprising determining operating parameters for the wireless node based on the site impact information.

29. The method of Claim 2, further comprising determining radio frequency (RF) coverage for the wireless node, interference impact of the wireless node,

and operating parameters for the wireless node based on the site impact information exchanged with the neighboring nodes.

5 30. The method of Claim 2, further comprising:
 negotiating operating parameters between the wireless node and the neighboring wireless nodes by receiving site impact information from the neighboring nodes, analyzing the site impact information, and
10 generating a set of operating parameters based on the analysis;

 transmitting the set of operating parameters to the neighboring nodes for neighbor analysis; and

15 receiving a modified set of operating parameters from the neighboring nodes based on the neighbor analysis.

20 31. The method of Claim 30, further comprising providing the site impact information to a control node in response to a failure to agree on operating parameters between the wireless node and the neighboring wireless nodes.

25 32. The method of Claim 31, wherein the control server is a operation, administration, and maintenance (OAM) server.

30 33. The method of Claim 1, further comprising:
 determining whether the wireless node is a new previously unconfigured site; and

 determining whether the wireless node comprises a configuration modification if the wireless node is a previously configured site.

34. The method of Claim 33, further comprising determining whether the wireless node comprises stored operating parameters if the wireless node does not 5 comprise the configuration modification.

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35. The method of Claim 2, further comprising:
requesting additional radio frequency (RF) channel from the neighboring wireless nodes in response 10 to a bandwidth shortfall in the wireless node;
selecting least interfering additional RF channels from RF channels provided by the neighboring nodes; and
reconfiguring the wireless node with the 15 additional least interfering RF channels.

36. The method of Claim 6, further comprising determining an interference impact on forward and reverse paths between the wireless node and each of the 20 neighboring wireless nodes.

37. A method for operating a wireless node, comprising:

activating the wireless node in a start up state;

5 automatically determining in the start up state a plurality of operating parameters for the wireless node;

configuring the wireless node based on the operating parameters;

10 activating a radio frequency (RF) system for the wireless node;

transitioning the wireless node to a learning state;

15 collecting operational data in the learning state and modifying the operating parameters based on the operational data;

reconfiguring the wireless nodes based on the modified operating parameters; and

20 transitioning the wireless node to a normal operating state in response to determining the operational data is within predefined parameters.

38. The method of Claim 37, further comprising negotiating with a plurality of neighboring nodes in the 25 start up state to determine the operating parameters.

39. The method of Claim 37, further comprising:

modifying a list of neighboring nodes in the learning state based on the operational data; and

30 modifying the operating parameters to account for the modified list of neighboring nodes.

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40. The method of Claim 37, further comprising negotiating with the neighboring nodes to determine the initial set of operating parameters.

5 41. The method of Claim 37, further comprising collecting operational data in the normal operating state and transitioning back to the learning state in response to determining the operational data is outside the predefined parameters.

10 42. The method of Claim 37, further comprising transitioning from the normal operating state back to the learning state in response to a change in neighboring wireless topology.

15 43. The method of Claim 37, further comprising transitioning from the normal operating state back to the learning state in response to accepting a modification in operating parameters requested by a neighboring node.

20 44. The method of Claim 37, wherein the wireless node is a wireless router.

25 45. The method of Claim 37, wherein the wireless node is a wireless router and then neighboring wireless nodes are neighboring wireless routers.

30 46. The method of Claim 37, further comprising analyzing the operational data and optimizing the traffic engineering parameters based on the operational data.

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47. A wireless node for a wireless communications network, comprising:

computer implementable instructions encoded in
5 at least one computer processable medium; and
the instructions operable upon processing to
establish connectivity between the a wireless node and at
least one wireline node, to establish connectivity
between the wireless node and a plurality of neighboring
10 wireless nodes through the wireline node, and to
configure the wireless node based on information
exchanged with the neighboring wireless nodes through the
wireline node.

15 48. The wireless node of Claim 47, wherein the
computer implementable instructions comprise software
stored in a computer-readable medium.

20 49. The wireless node of Claim 47, wherein the
computer implementable instructions comprise instructions
encoded in a specialized processor.

25 50. The wireless node of Claim 49, wherein the
specialized processor comprises a field programmable gate
array (FPGA).

51. The wireless node of Claim 49, wherein the
specialized processor comprises an application specific
integrated circuit (ASIC).

52. The wireless node of Claim 47, the instructions operable upon processing to exchange site impact information between the wireless node and the neighboring wireless nodes and to configure the wireless node based 5 on site impact information received from the neighboring wireless nodes.

53. The wireless node of Claim 47, the instructions further operable upon processing to establish 10 connectivity between the wireless node and the neighboring wireless routers by broadcasting a wireless discovery message through the wireline node to a set of nodes, the wireless discovery message including site impact information on the wireless node, and to identify 15 the neighboring wireless nodes based on neighboring reply messages generated by the neighboring wireless node based on the wireless discovery message.

54. The wireless node of Claim 47, the instructions 20 further operable upon processing to negotiate operating parameters between the wireless node and the neighboring wireless nodes.

55. The wireless node of Claim 47, the instructions 25 further operable upon processing to establish a virtual path between the wireless node and each of the neighboring wireless nodes.

56. The wireless note of Claim 47, the instructions 30 further operable upon processing to established a label switch path (LSP) between the wireless node and each of the neighboring wireless nodes.

57. The wireless node of Claim 47, wherein connectivity between the wireless node and the wireline node is established using the Internet protocol.

5 58. The wireless node of Claim 55, the instructions operable upon processing to determine an interference impact on forward and reverse virtual paths between the wireless node and the neighboring wireless nodes.

10 59. The wireless node of Claim 47, wherein connectivity between the wireless node and the neighboring wireless nodes is established through the set of wireline routers using the Internet protocol.

15 60. The wireless node of Claim 47, the instructions further operable upon processing to determine services available to the wireless node using the wireline and wireless connectivity.

20 61. The wireless node of Claim 47, wherein the wireless node is a wireless router and the wireline node is a wireline router.

25 62. The wireless node of Claim 52, wherein the site impact information for the wireless node comprises geographic parameters for the wireless node.

30 63. The wireless node of Claim 52, wherein the site impact information for the wireless node comprises network configuration parameters for the wireless node.

64. The wireless node of Claim 52, wherein the site impact information for the wireless node comprises service configuration parameters for the wireless node.

5 65. The wireless node of Claim 52, wherein the site impact information for the wireless node comprises antenna parameters for the wireless node.

10 66. The wireless node of Claim 52, wherein the site impact information for the wireless node comprises a plurality of geographic parameters, network configuration parameters, service configuration parameters, and antenna parameters for the wireless node.

15 67. The wireless node of Claim 52, wherein the site impact information for the wireless node comprises technology specific information for the wireless node.

20 68. The wireless node of Claim 67, wherein the site impact information for the wireless node comprises coverage parameters for the wireless node.

25 69. The wireless node of Claim 67, wherein the site impact information for the wireless node comprises spectrum parameters for the wireless node.

70. The wireless node of Claim 67, wherein the site impact information for the wireless node comprises channel parameters for the wireless node.

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71. The wireless node of Claim 67, wherein the site impact information for the wireless node comprises interference parameters for the wireless node.

72. The wireless node of Claim 67, wherein the site impact information for the wireless node comprises control parameters for the wireless node.

5 73. The wireless node of Claim 67, wherein the site impact information for the wireless node comprises threshold parameters for the wireless node.

10 74. The wireless node of Claim 67, wherein the site impact information for the wireless node comprises a plurality of coverage, spectrum, channel, interference, control, and threshold parameters for the wireless node.

15 75. The wireless node of Claim 52, the instructions operable upon processing to determine radio frequency (RF) coverage for the wireless node based on the site impact information.

20 76. The wireless node of Claim 52, the instructions operable upon processing to determine interference between the wireless node and the neighboring wireless nodes based on the site impact information.

25 77. The wireless node of Claim 52, the instructions operable upon processing to determine operating parameters for the wireless node based on the site impact information.

78. The wireless node of Claim 52, the instructions operable upon processing to determine radio frequency (RF) coverage for the wireless node, interference impact of the wireless node, and operating parameters for the 5 wireless node based on the site impact information exchanged with the neighboring nodes.

79. The wireless node of Claim 52, the instructions operable upon processing to negotiate operating 10 parameters between the wireless node and the neighboring wireless nodes by receiving site impact information from the neighboring nodes, analyzing the site impact information, and generating a set of operating parameters based on the analysis, to transmit the set of operating 15 parameters to the neighboring nodes for neighbor analysis, and to receive a modified set of operating parameters from the neighboring nodes based on the neighbor analysis.

80. The wireless node of Claim 79, the instructions operable upon processing to provide the site impact information to a control node in response to a failure to agree on operating parameters between a wireless node and the neighboring wireless nodes.

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81. The wireless node of Claim 80, wherein the control server is an operation, administration, and maintenance (OAM) server.

82. The wireless node of Claim 47, the instructions operable upon processing to determine whether the wireless node is a new previously unconfigured site and to determine whether the wireless node comprises a configuration modification if the wireless node is a previously configured site.

83. The wireless node of Claim 82, the instructions operable upon processing to determine whether the wireless node comprises stored operating parameters if the wireless node does not comprise the configuration modification.

84. The wireless node of Claim 47, the instructions operable upon processing to request additional radio frequency (RF) channels from the neighboring wireless nodes in response to a bandwidth shortfall in the wireless node, to select least interfering additional RF channels from RF channels provided by the neighboring nodes, and to reconfigure the wireless node with the additional least interfering RF channels.

85. A wireless node for wireless communications network, comprising:

computer implementable instructions encoded in
5 at least one computer processable medium; and
the instructions operable upon processing to
activate the wireless node in a start-up state, to
automatically determine in the start-up state a plurality
of operating parameters for the wireless node, to
10 configure the wireless node based on the operating
parameters, to activate a radio frequency (RF) system for
the wireless node, to transition the wireless node to a
learning state, to collect operational data in the
learning state and modify the operating parameters based
15 on the operational data, to reconfigure the wireless
nodes based on the modified operating parameters, and to
transition the wireless node to a normal operating state
in response to determining the operational data is within
predefined parameters.

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86. The wireless node of Claim 85, the instructions
operable upon processing to negotiate with a plurality of
neighboring nodes in the start-up state to determine the
operating parameters.

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87. The wireless node of Claim 85, the instructions
operable upon processing to modify a list of neighboring
nodes in the learning state based on the operational data
and to modify the operating parameters to account for the
30 modified lists of neighboring nodes.

88. The wireless node of Claim 85, the instructions operable upon processing to negotiate with the neighboring nodes to determine the initial set of operating parameters.

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89. The wireless node of Claim 85, the instructions operable upon processing to collect operational data in the normal operating state and to transition back to the learning state in response to determining the operational data is outside the predefined parameters.

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90. The wireless node of Claim 85, the instructions operable upon processing to transition from the normal operating state back to the learning state in response to a change in the neighboring wireless topology.

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91. The wireless node of Claim 85, the instructions operable upon processing to transition from the normal operating state back to the learning state in response to accepting a modification and operating parameters requested by a neighboring node.

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92. The wireless node of Claim 85, wherein the wireless node is a wireless router.

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93. The wireless node of Claim 85, wherein the wireless node is a wireless router and the neighboring wireless nodes are neighboring wireless routers.

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94. The wireless node of Claim 85, the instructions operable upon processing to analyze the operational data and to optimize the traffic engineering parameters based on the operational data.

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95. A method for configuring a wireless router in a wireless communications network, comprising:

5 automatically determining a Internet protocol (IP) topography for a wireless router; and

10 automatically determining a radio frequency (RF) topology for the wireless router based on information exchanged with neighboring wireless routers identified using the IP topology.

15 96. The method of Claim 95, wherein the information exchanged comprises access technology of the wireless router.

20 97. The method of Claim 95, wherein the information exchanged comprises RF coverage parameters of the wireless router.

25 98. The method of Claim 95, wherein the information exchanged comprises network configuration information for the wireless router.

99. The method of Claim 95, wherein the information exchanged comprises interference parameters for the wireless router.

100. The method of Claim 95, wherein the information exchanged comprises channel configuration information for the wireless router.

30 101. The method of Claim 95, wherein the information exchanged comprises control parameters for the wireless router.

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102. The method of Claim 95, wherein the information exchanged comprises a plurality of RF access technology, RF coverage, network configuration parameters, interference parameters, channel configuration parameters, and control parameters.

103. A method for providing connectivity between mobile devices and an Internet protocol (IP) network, comprising:

5 providing a set of neighboring wireless routers, each operable to receive data packets from a mobile device and to route the data packets to the IP network;

10 providing connectivity between the set of neighboring wireless routers through a set of wireline routers in the IP network; and

15 exchanging interference impact information between the neighboring wireless routers to adjust operating parameters of the wireless routers in response to variations in the wireless network.

104. The method of Claim 103, further comprising in response to one of the set of neighboring wireless routers being deactivated, exchanging impact information between the remaining wireless routers in the set and adjusting operating parameters in the remaining wireless routers to account for the absence of the deactivated wireless router.

25 105. The method of Claim 103, further comprising in response to activation of a new neighboring wireless router, exchanging impact information between the neighboring wireless routers and adjusting operating parameters in the neighboring wireless routers to account 30 for addition of the new neighboring wireless router.

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106. The method of Claim 103, further comprising exchanging interference impact information and adjusting operating parameters between the neighboring wireless routers in response to a configuration change in the set 5 of neighboring wireless routers.

107. The method of Claim 103, further comprising exchanging impact information and adjusting operating parameters between the neighboring wireless routers in 10 response to a status change in one of the neighboring wireless routers.

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